



EERC Technology – Putting Research into Practice

Plains CO₂ Reduction (PCOR) Partnership

November 3, 2003

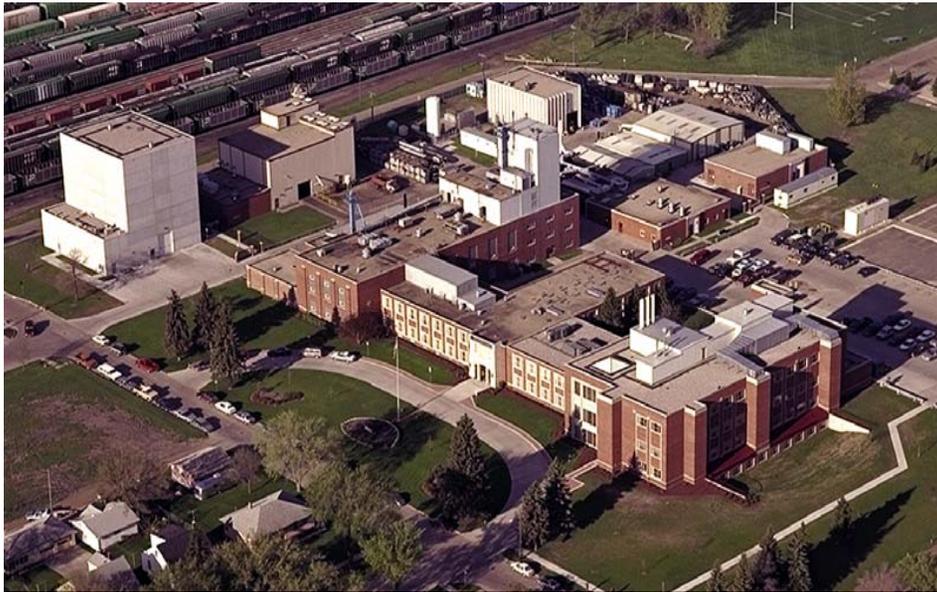
*Presented at the Regional Carbon Sequestration
Partnership Meeting
Pittsburgh, Pennsylvania*



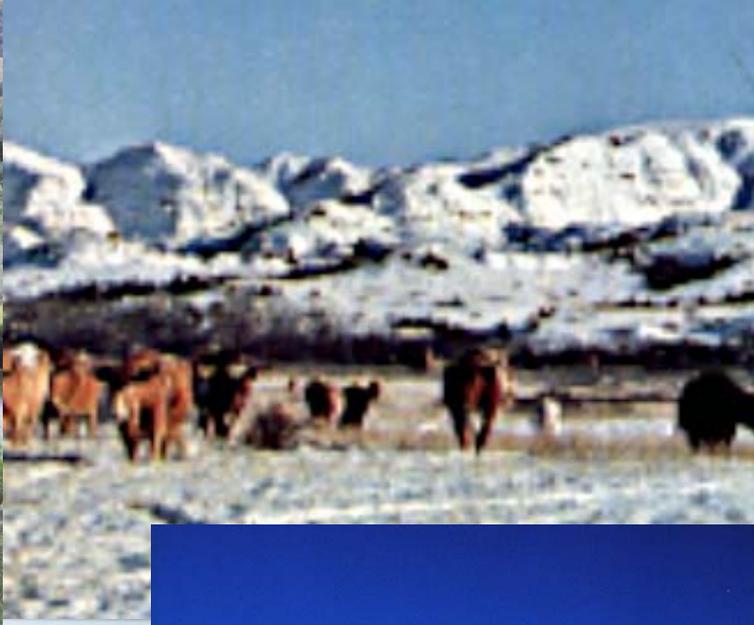
University of North Dakota

About the EERC

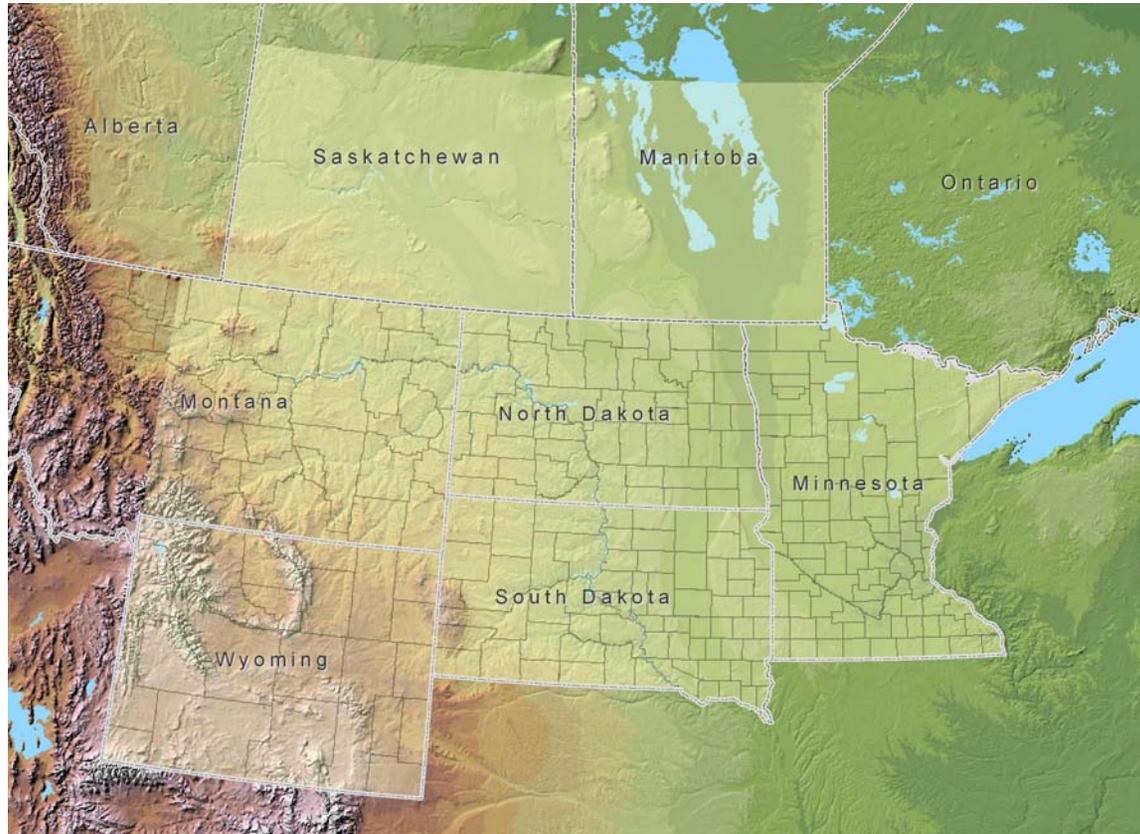
The EERC is a research, development, demonstration, and commercialization facility recognized internationally for its expertise in:



- Cleaner, more efficient energy technologies.
- Air and water pollution prevention and cleanup.
- Water management.
- Contamination cleanup and site remediation.
- Waste management and utilization.
- Advanced analytical methods.
- Education and training.

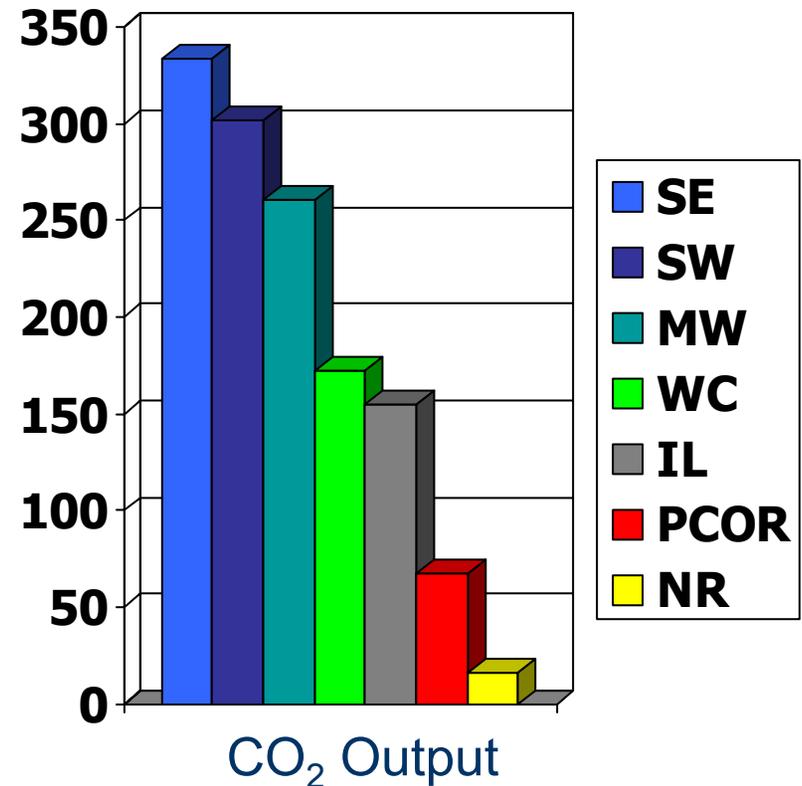


Plains CO₂ Reduction Partnership – Region



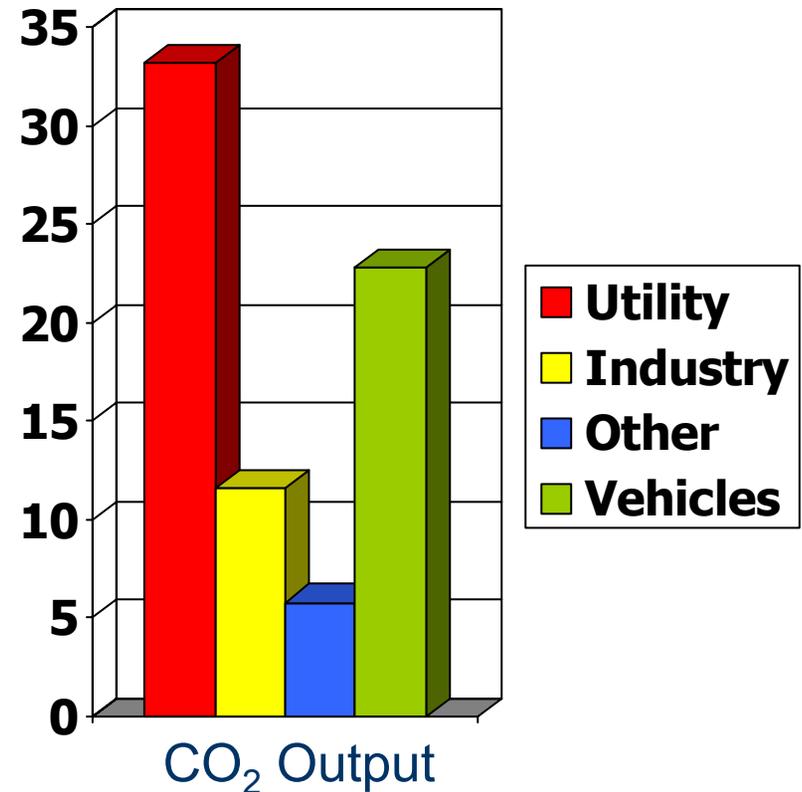
RCSP Regions – Energy-Related CO₂ Output

- Total U.S. energy-related CO₂ output = 1477 MMTCE/yr.
- RCSP regions account for 33 states and 79% of U.S. output.
- PCOR Partnership region ranks sixth among RCSP regions in CO₂ output.

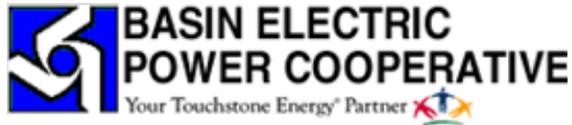


PCOR Partnership Region – Energy-Related CO₂ Profile

- 67.6 MMTCE/yr regional CO₂ output
- 2/3 large stationary sources
- Region accounts for 4.6% U.S. total
- Geologic, value-added sequestration projects



Plains CO₂ Reduction Partnership – Sponsors



NDSU

North Dakota Industrial Commission



**Environment
Canada**



**Western
Governors'
Association**



**Dakota
Gasification
Company**

Fischer Oil and Gas

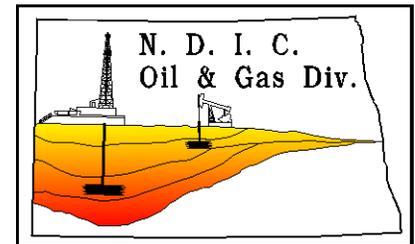


EERC

Energy & Environmental Research Center



**Minnesota Pollution
Control Agency**



Prairie Public Television

Interstate Oil and Gas Compact Commission

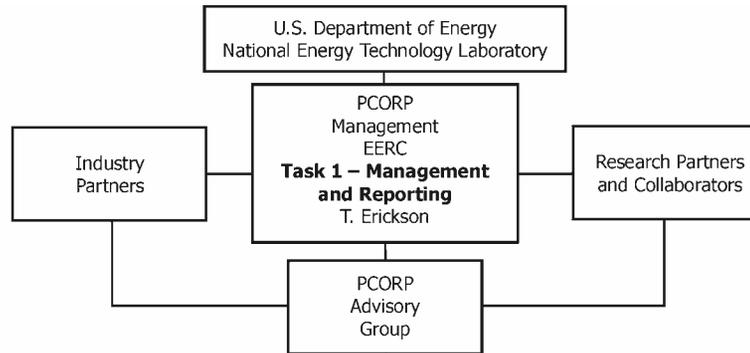
Plains CO₂ Reduction Partnership – Partner Contributions

		Task 1	Task 4			Task 2	Task 3	Task 5	
Role	Organization	Mgt., Reporting	Source	Sink	CO ₂ Separation and Transport	Regulatory Issues	Public Outreach	Technology Assessment	Action Plans
Project Management	EERC	P	P	P	P	P	P	P	P
Research Partners	DGC		S	S	P	S		S	S
	Fischer Oil and Gas			P		S		S	S
	Nexant-Bechtel				P	S		P	S
	North Dakota State University			P		S		S	S
	Prairie Public Television						P		
Industrial Sponsors	Basin Electric Power Cooperative, DGC, Montana-Dakota Utilities, Otter Tail Power, NDIC, Great River Energy		S			S	S	S	S
Collaborating Partners	State, provincial, and federal regulatory agencies; Western Governors' Association; Petroleum Technology Transfer Council; Amerada Hess, Environment Canada			S		P	S	S	S

Plains CO₂ Reduction Partnership – Funding

- U.S. Department of Energy \$1,586,000
- Industry sponsors (cash) \$ 360,000
- In-kind contributions \$ 800,000
 - Dakota Gasification – \$700,000
- Total project \$2,750,000

Plains CO₂ Reduction Partnership – Organization



EERC DD21484.CDR

Task 2 Deployment Issues	Task 3 Public Perception and Outreach	Task 4 Characterization and Evaluation			Task 5 Modeling and Phase II Action Plans	
J. Harju (EERC)	D. Daly (EERC)	J. Sorensen (EERC)			T. Erickson (EERC)	
Environmental and Permitting Working Group	Public Perception and Outreach Working Group	Sources Working Group	Sinks Working Group	Separation and Transportation Working Group	Modeling Working Group	Action Plan Working Group
J. Harju (EERC)	D. Daly (EERC)	D. Laudal (EERC)	J. Sorensen (EERC)	M. Musich (EERC)	T. Erickson (EERC)	T. Erickson (EERC)
State Environmental Regulatory Offices – MN – ND – SD – WY EPA Environment Canada Dakota Gasification	Prairie Public Television Western Governors' Association Petroleum Technology Transfer Council ND Lignite Council	Dakota Gasification Basin Electric Montana-Dakota Utilities Otter Tail Power Great River Energy	NDIC OGD ND Geological Survey NDSU Fischer Oil & Gas Dakota Gasification ND Lignite Council Amerada Hess Corporation	Dakota Gasification NDIC Nexant-Bechtel	Nexant-Bechtel IOGGC NDOGC	Representation Chosen by the Work Groups
Technical Support Capabilities Data Management and GIS Capability, E. O'Leary (EERC)						

Task 1 – Program Management

- Overall program management
 - Subcontract management
 - Budget management
 - Communications with DOE
 - Communications with partners
-
- Coordination of Advisory Group and Working Groups

Advisory Group

- Comprises industrial sponsors, collaborating partners, and regional and national stakeholders
- Meets one to two times per year
- Provides guidance on the overall direction of the program
- Provides direction on additional information and activities that would support this project

Working Groups

- Comprised of members of the advisory group as well as research team members
- Provide direction on the specific research activities within the given topic
- Support the individual working groups through in-kind contributions

Task 1 – Completed and Future Activities

- Research kickoff meeting on October 22 in Grand Forks
- Dakota Gasification kickoff meeting in Beulah, ND, on October 23
- All partnering agreements near completion
- Pursuing new sponsors
- Invitations out to all Advisory Board members (25)

Task 1 – Completed and Future Activities (cont.)

- Presented to the Natural Resources Trust
- Presented to the ND Oil and Gas Council
- Presenting to the Basin members meeting November 5, Bismarck, ND
- Advisory Board kickoff meeting – December 11 and 12, Grand Forks

Technology Deployment



Dakota Gasification CO₂ Capture and Transport – EnCana Corp.
Weyburn Enhanced Oil Recovery



Task 2 – Technology Deployment Issues

- Safety, regulatory and permitting requirements
- Public perceptions
- Ecosystem impacts
- Monitoring and verification

Regional EOR Projects – Experience in CO₂ Transportation, Injection, and Monitoring

- Dakota Gasification – EnCana Weyburn field sites
- Anadarko CO₂ pipeline – Shute Creek gas-processing plant to Salt Creek, WY

Weyburn Project – Pipeline Map



CO₂ Supply
IEA Weyburn CO₂ Monitoring and Storage Project
Image courtesy of EnCana

Weyburn CO₂ Flood EOR Project – Key Information

- Location – near town of Weyburn, Saskatchewan
- Operating company – Encana Corporation
- CO₂ provider – Dakota Gasification Company
- 95 mmscfd (5000 metric tons/day) CO₂ from DGC contracted and injected
- CO₂ purity 95%
- EnCana currently injects 120 mmscfd (21% recycle)
- Incremental oil >5000 bbl/day
- CO₂ injection started September 2000
- 70 billion cubic feet (bcf) CO₂ injected as of September 2003

Task 2 – Completed and Future Activities

- Reviewing DGC and other regional activities for baseline information
- Organizing working groups
- Developing the two-year work plan

Public Outreach



Task 3 – Public Outreach

- Create informed stakeholders in the PCOR Partnership region
 - Successful sequestration projects require public acceptance.
 - Sequestration is a new, relatively unknown strategy.
 - Effective communication of benefits and risks associated with sequestration strategies is the basis for public acceptance.

Approach

- Public outreach/education working group
- Public outreach/education plan
- Conduct public information campaign
- Gauge level of public understanding
- Coordinate with and build on DOE's RCSP efforts and local partner efforts

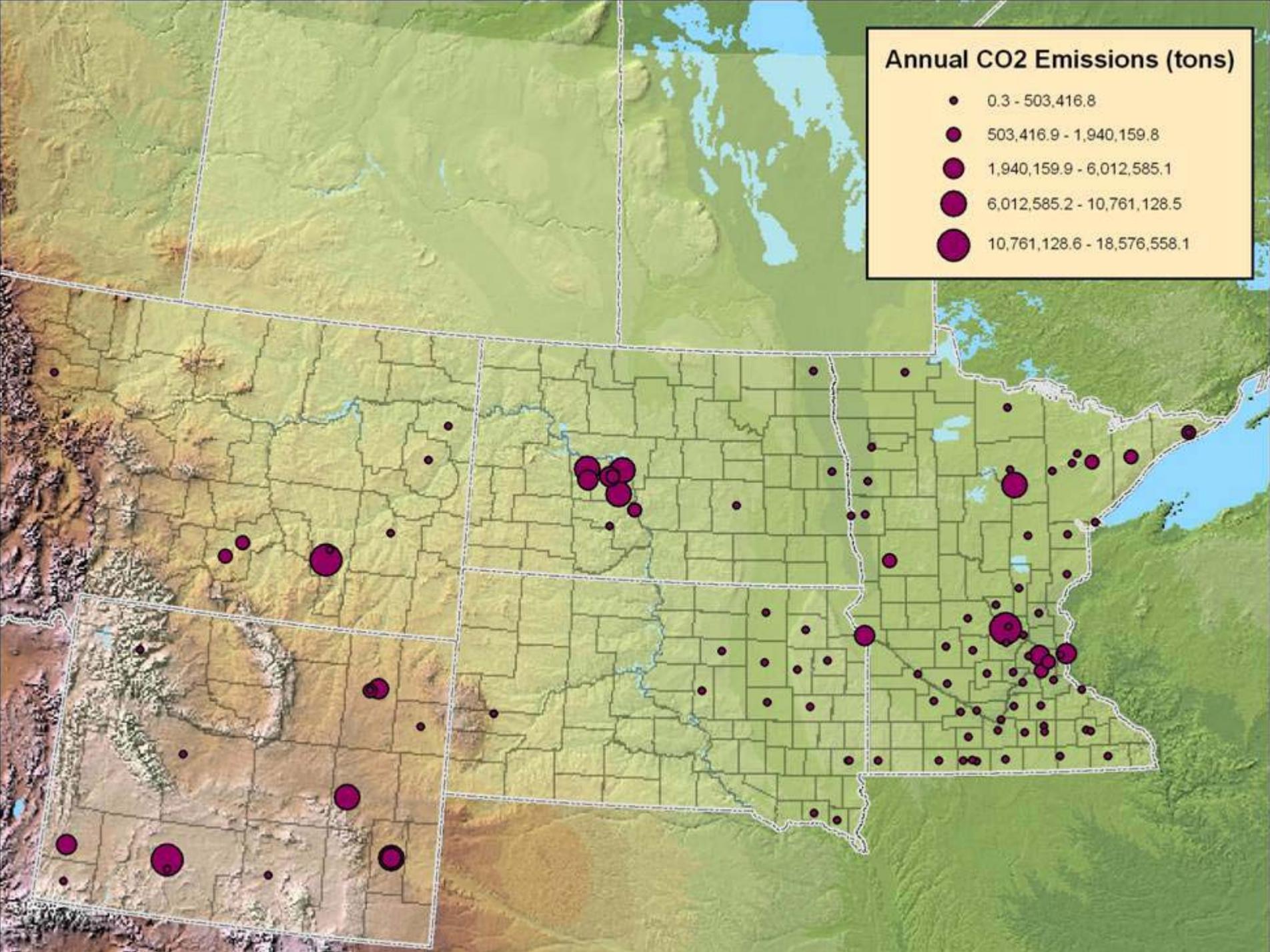
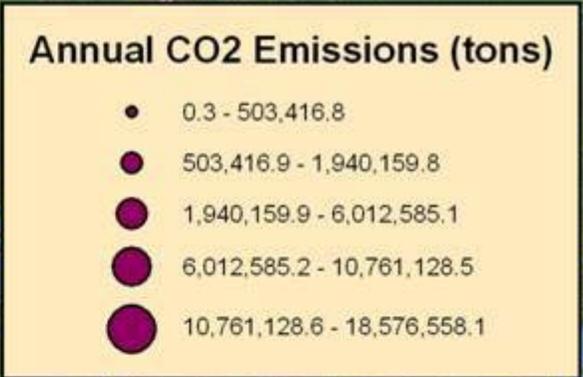
Task 3 – Completed and Future Activities

- Initial PCOR Partnership fact sheet
- Developing two-year work plan
- K-12 educational packages
- Newspaper series
- 30-minute video
- Series of fact sheets

Task 4 – Sources, Sinks, and Infrastructure

Source Characterization

- Sources to be evaluated
 - Coal-fired power plants
 - Great Plains Gasification Plant
 - Ethanol production facilities
 - Oil refineries
 - Natural gas-processing plants



Task 4 – Sources, Sinks, and Infrastructure

Source Characterization

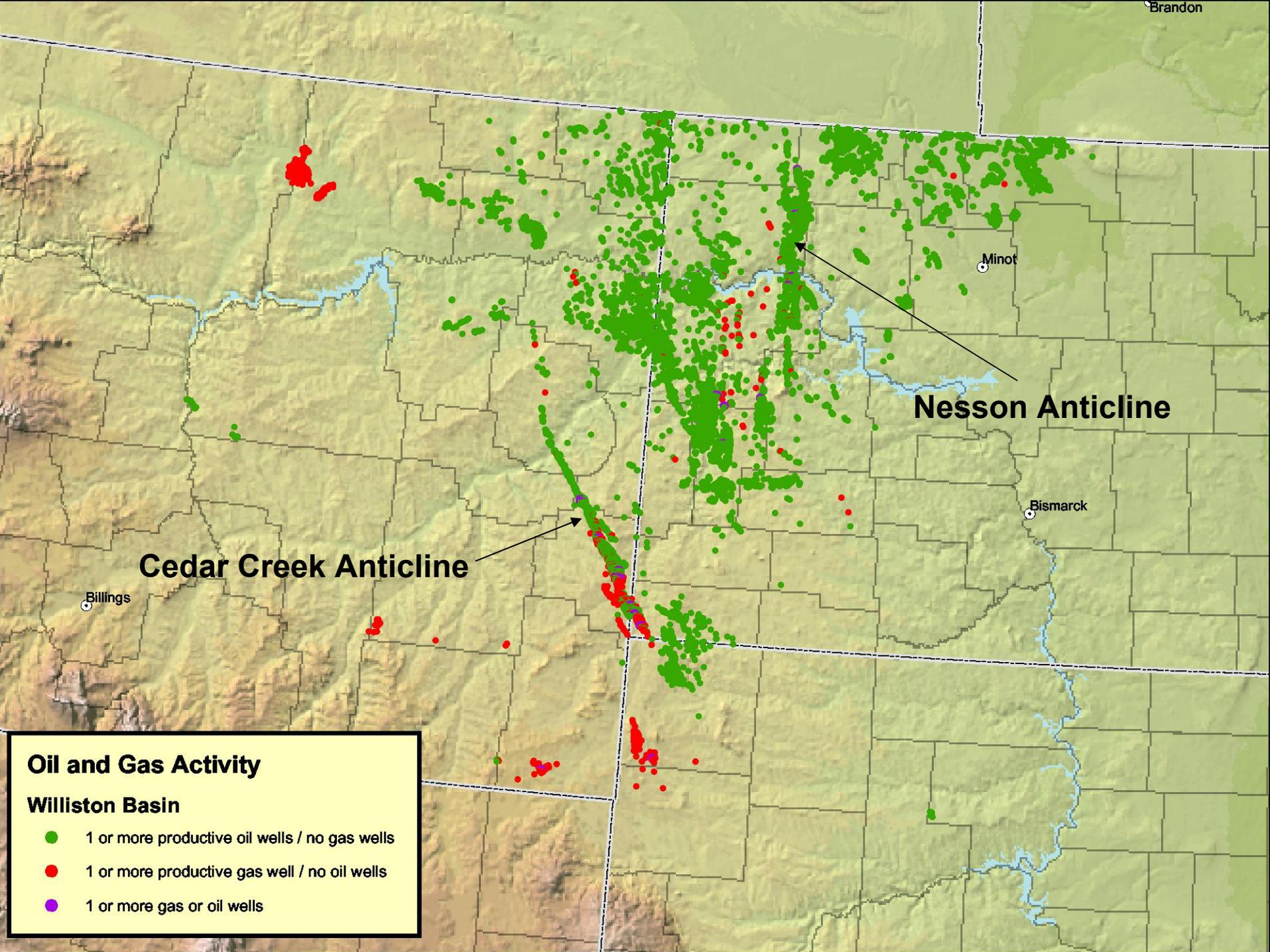
- Sources to be evaluated, continued
 - Taconite plants
 - Paper mills
 - Sugar plants
 - Cement plants
 - Waste incinerators
 - Manufacturing plants

Task 4 – Sources, Sinks, and Infrastructure

Sink Characterization

- Geologic sinks
 - Petroleum reservoirs with potential for enhanced oil or gas recovery (EOR and EGR)
 - Weyburn CO₂ EOR project
 - Depleted petroleum reservoirs
 - Deep brine formations
 - Unminable coal beds
 - Coal seams with potential for enhanced coalbed methane recovery (ECBM)

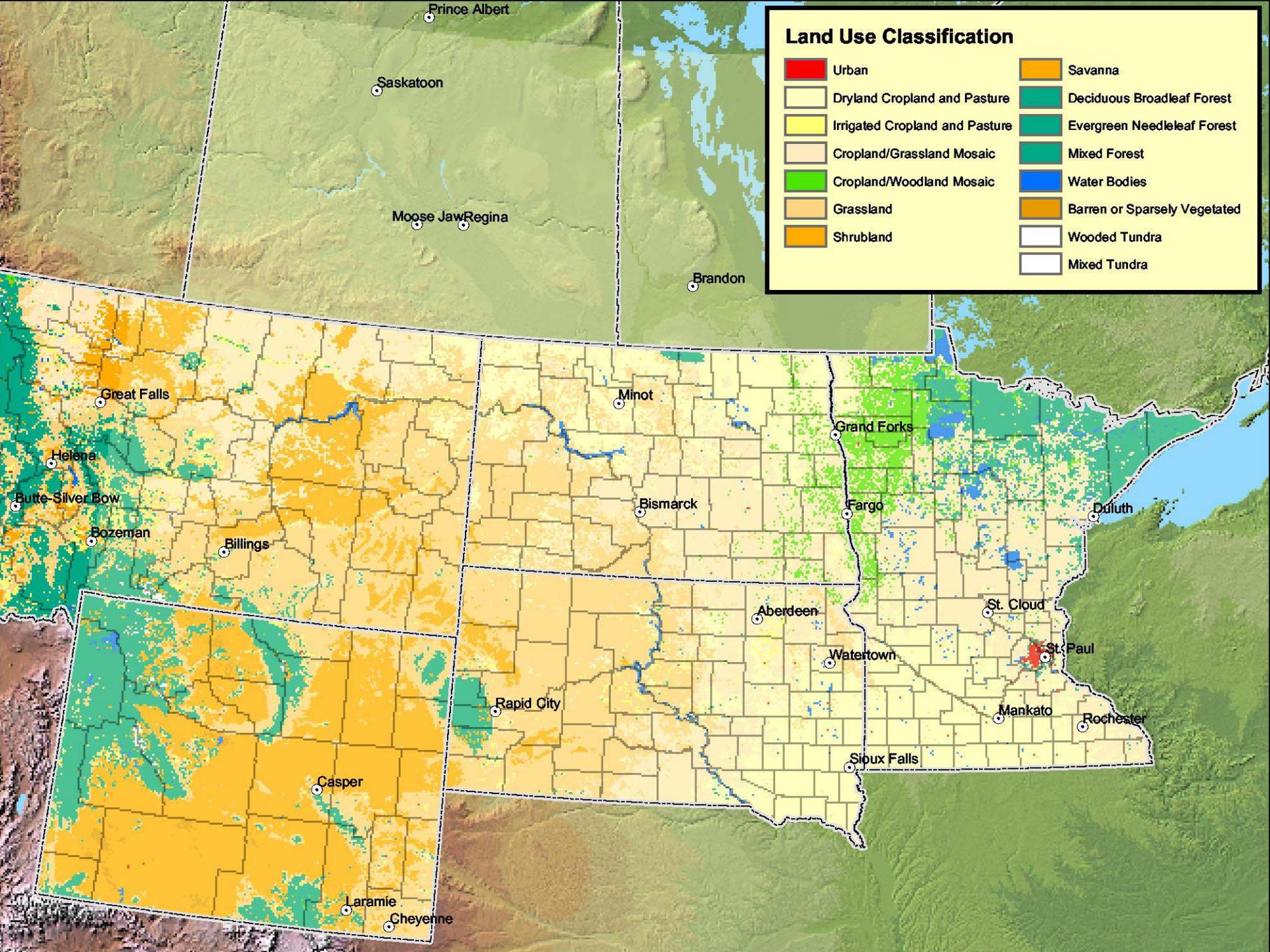




Task 4 – Sources, Sinks, and Infrastructure

Sink Characterization

- Terrestrial sinks
 - Current agricultural land uses
 - Crop types
 - Management practices
 - Alternative land use and agricultural practices
 - Forests



Task 4 – Sources, Sinks, and Infrastructure

Infrastructure Characterization

- Separations
- Gas Cleanup
- Transportation

Task 4 – Completed and Future Activities

- Developed data-gathering standards and quality assurance measures
- Initiated data gathering for all activities
- Developed internal database and GIS Web site

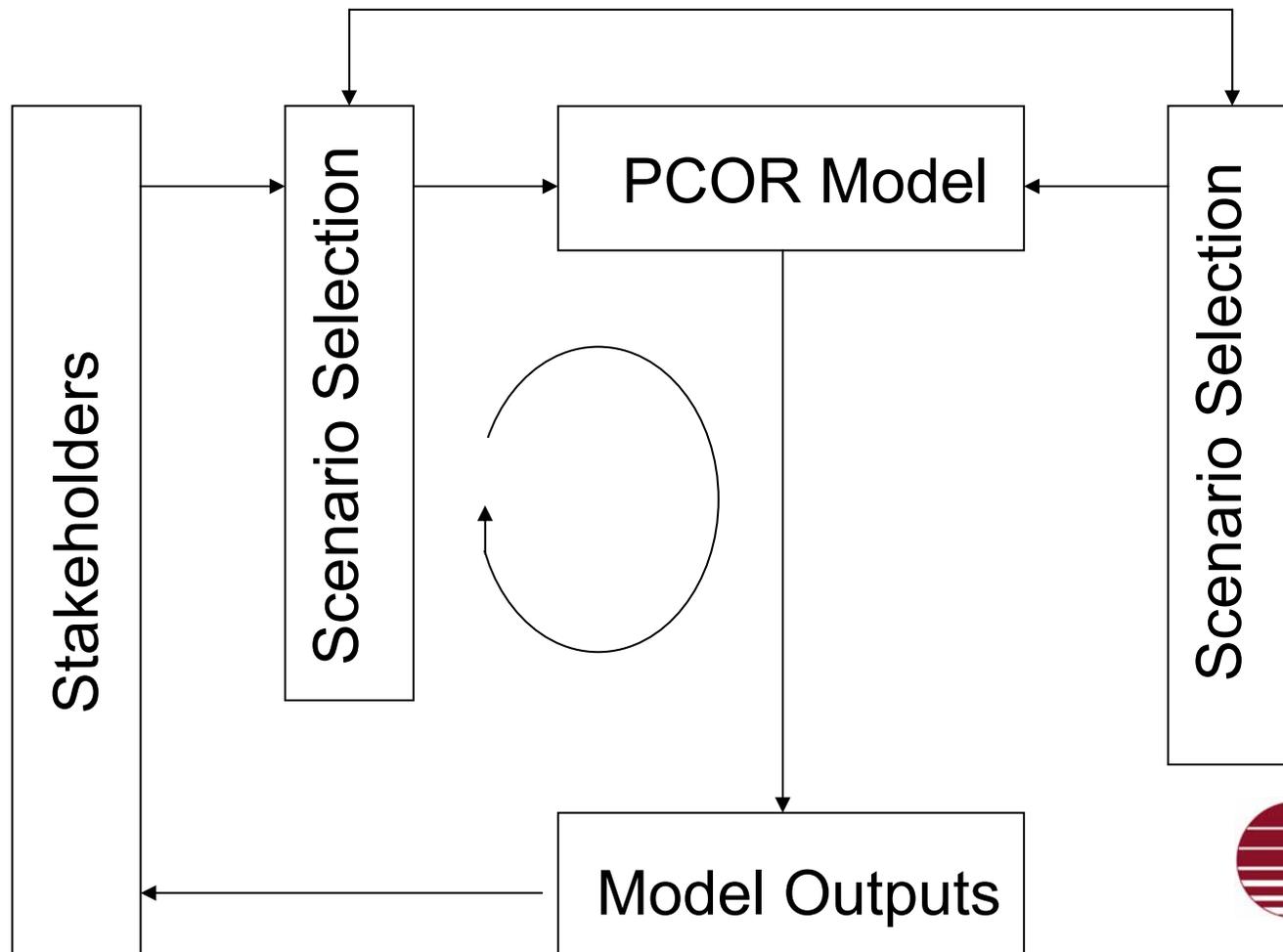
Task 5 – Modeling

- Model vs. Modeling Approach
 - Model – the way in which you process the given information to generate a series of answers.
 - Model approach – the way we feed the model the information and refine its application through iterations.

PCOR Partnership Model



Modeling Approach



Task 5 – Completed and Future Activities

- Currently developing model functions.
- Upon completion of model first draft, we will run a baseline on DGC–Weyburn activities.

Contact Information

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